**Achievement objectives: Chemistry 2012**

**Chemistry is about the composition and properties of matter, the changes it undergoes, and the energy involved.**

*The New Zealand Curriculum* specifies two sets of achievement objectives for chemistry:

* Properties and changes of matter
* The structure of matter
* Chemistry and society

The curriculum also specifies four sets of achievement objectives for the Nature of Science strand:

* Understanding about science
* Investigating in science
* Communicating in science
* Participating and contributing

The focus of the contextual strands is the ideas *of*science; the focus of the Nature of Science strand is ideas *about*science. Scientific literacy is developed through learning in both kinds of ideas.

**Considerations for teachers**

Central to all study of chemistry is the recognition that, for any substance, the properties and behaviours that we can observe and measure are the result of the properties and behaviours of sub-microscopic particles that we cannot see; it is of these particles that the substance is made.

Chemists carry out reactions at what is known as the macroscopic level, and they think about reactions at the particulate or sub-microscopic level. They often use symbols to represent their observations.

All learning in chemistry should be related to its practical applications in everyday life.

To make the necessary connections, a chemistry programme should include learning in all three achievement objectives at each level of the curriculum.

**Progression in chemistry**

Students’ progress in learning chemistry is demonstrated by their increasingly sophisticated ability to identify, explain, apply and reflect on the role of chemistry in the natural and physical world. This will be observed when they relate the properties of a range of groups of substances to the nature of the particles of which they are made and to the symbols and conventions of chemistry.

As they progress, students move:

* from a focus on matter and the changes it undergoes to a focus on the composition and properties of matter and the energy involved as it undergoes change
* from a focus on how substances behave in isolation to a focus on how they interrelate; this may include consideration of their impact on society
* from a focus on observing the behaviour of substances to a focus on explaining these observations using the fundamental concepts of chemistry
* from a focus on understanding the nature of particles to a focus on using their understanding of the nature of particles to predict the properties and reactions of materials.

**Indicators**

Indicators are examples of the behaviours and capabilities that a teacher might expect to observe in a student who is achieving at the appropriate level. Teachers may wish to add further examples of their own.

**Context elaborations**

Context elaborations are possible contexts for learning, with a suggestion of how they might be used with the focus achievement objective.

The listed context elaborations are examples only. Teachers can select and use entirely different contexts in response to local situation, community relevance, and students’ interests and needs.

[TOP](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry#wrapper)

**NCEA: What has changed?**

* The achievement standards have been designed to align with the NZC, and reflect the change in direction for science education. Most existing programmes will need to be reshaped to meet the achievement aims for science, and in particular the Nature of Science.
* The Nature of Science aims and objectives have been embedded and integrated into all standards.
* The explanatory notes for each standard indicate which science achievement objectives are the focus.
* Key terms such as *investigate, demonstrate understanding* and *justify* are fully explained in the explanatory notes.
* The additional information/teacher guideline sections of exemplar resources (internal tasks) provide further guidance around how the Nature of Science is involved, for example, Science 1.6A.
* See assessment for qualifications section for each achievement objective. This suggests possible assessment activities related to each particular achievement objective.

**Achievement objectives**

Students will:

**Level 6**

**Properties and changes of matter**

* [MW 6-1](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-6-1) Identify patterns and trends in the properties of a range of groups of substances, for example, acids and bases, metals, metal compounds, and hydrocarbons; Explore factors that affect chemical processes.

**The structure of matter**

* [MW 6-2](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-6-2) Distinguish between atoms, molecules, and ions (includes covalent and ionic bonding); Link atomic structure to the organisation of the periodic table; Use particle theory to explain factors that affect chemical processes.

**Chemistry and society**

* [MW 6-3](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-6-3) Investigate how chemical knowledge is used in a technological application of chemistry.

**Level 7**

**Properties and changes of matter**

* [MW 7-1](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-7-1) Investigate and measure the chemical and physical properties of a range of groups of substances, for example, acids and bases, oxidants and reductants, and selected organic and inorganic compounds.

**The structure of matter**

* [MW 7-2](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-7-2) Relate properties of matter to structure and bonding; Develop an understanding of and use the fundamental concepts of chemistry (for example, equilibrium and thermochemical principles) to interpret observations.

**Chemistry and society**

* [MW 7-3](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-7-3) Apply knowledge of chemistry to explain aspects of the natural world and how chemistry is used in society to meet needs, resolve issues, and develop new technologies.

**Level 8**

**Properties and changes of matter**

* [MW 8-1](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-8-1) Investigate and measure the chemical and physical properties of a range of groups of substances, for example, acids and bases, oxidants and reductants, and selected organic and inorganic compounds.

**The structure of matter**

* [MW 8-2](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-8-2) Relate properties of matter to structure and bonding; Develop an understanding of and use the fundamental concepts of chemistry (for example, equilibrium and thermochemical principles) to interpret observations.

**Chemistry and society**

[MW 8-3](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Chemistry/AO-MW-8-3) Apply knowledge of chemistry to explain aspects of the natural world and how chemistry is used in society to meet needs, resolve issues, and develop new technologies.